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NEWPORT

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NP10 8QQ**Request for grant of a patent**

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

1. Your reference

SL/AFD/OML.60

2. Patent a
(The Date)**0205066.4**

5 MAR 2002

3. Full name, address and postcode of the or of each applicant (*underline all surnames*)

Owen Mumford Limited
Brook Hill
Woodstock
Oxford OX20 1TU

Patents ADP number (*if you know it*)

United Kingdom

441373802

4. Title of the invention

Improvements relating to injection device

5. Name of your agent (*if you have one*)

Wynne-Jones, Laine & James

"Address for service" in the United Kingdom to which all correspondence should be sent
(*including the postcode*)

22 Rodney Road
Cheltenham
Gloucestershire GL50 1JJ

Patents ADP number (*if you know it*)

1792001 N

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (*if you know it*) the or each application number

Country

Priority application number
(*if you know it*)Date of filing
(*day / month / year*)

n/a

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing
(*day / month / year*)

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8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

YES

- a) any applicant named in part 3 is not an inventor, or
 - b) there is an inventor who is not named as an applicant, or
 - c) any named applicant is a corporate body.
- See note (d)*

Patents Form 1/77

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Continuation sheets of this form

Description 5

Claim(s) -

Abstract -

Drawing(s)

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10. If you are also filing any of the following, state how many against each item.

Priority documents 3

Translations of priority documents -

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for preliminary examination and search (Patents Form 9/77)

Request for substantive examination (Patents Form 10/77)

Any other documents
(Please specify) -

11.

I/We request the grant of a patent on the basis of this application.

Signature *[Signature]*

Date

4.3.2002

12. Name and daytime telephone number of person to contact in the United Kingdom

Wynne-Jones, Lainé & James
Mr S J Laine 01242 515807

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Improvements relating to injection devices

This invention relates to injection devices. It is concerned with those devices for medical use where a 5 syringe is loaded into a firing mechanism which first thrusts the syringe forwards to project the needle, and then acts on the piston within the syringe to express the dose.

It is well known to use a single drive spring which, 10 when released, acts on a plunger directly connected to the piston of the syringe. The incompressibility of the dose and the fineness of the needle means that the syringe is thrust forwards by the force on its piston. But once the needle is projected the syringe is arrested while the drive 15 spring continues to act to expel the dose through the needle. There is sometimes a return spring which acts between the syringe and the housing and which is compressed as the syringe moves forwards.

Certain syringes have large needles which require 20 substantial force to make them penetrate. Also there have been developed low friction bungs or pistons for syringes, making it easier to expel a dose. With a combination of a large needle and a low friction piston, and with the single drive spring technique described above, there will be a 25 tendency for the piston to start moving forwards within the

syringe before the needle has fully penetrated. The dose will therefore start to be delivered whilst the tip of the needle is still moving into the flesh, and not all the intended dose will be ejected at the correct depth.

5 It is therefore desirable for this "pre-drip" to be eliminated as far as possible, which is what the proposal described below seeks to do.

According to the present invention there is provided an injection device having a housing with a spring drive releasable sequentially to urge a syringe within the 10 housing forwards to project its needle from the forward end of the housing and then to press the piston within the syringe forwards to eject a dose through the needle, wherein the spring drive includes a first spring that acts 15 between the housing and a plunger aligned to co-operate with the piston, and a second spring that acts between the plunger and the syringe, the second spring being weaker than the first spring but being sufficiently stiff to be in an expanded state when the syringe reaches its forward 20 position with its needle penetrating flesh, wherein the first spring then compresses the second spring as it fully expands to urge the plunger forwards and thereby move the piston and expel the dose within the syringe, the second

spring meanwhile serving to retain the syringe seated at its forward position.

Thus the piston is not acted upon until the needle has penetrated.

5 It is unlikely that the second spring will act directly on the syringe. Instead, the plunger may have a collar slidable lengthwise within limits, and the second spring will bear on the rear side of this collar while its forward side co-operates with the syringe.

10 To keep the syringe in place initially there may be a third, light spring urging the syringe rearwardly so that its needle is retracted within the housing. Conveniently this spring encircles the syringe and acts between the rear flange of the syringe and an internal shoulder of the 15 housing. Although compressed during the injection process it will not be powerful enough to affect the action of the first and second springs, nor will it cause the syringe to retract after use.

20 For a better understanding of the invention, one embodiment will now be described, by way of example, with reference to the accompanying drawing, in which the single figure is a diagrammatic axial section of an injection device.

The device has a barrel 1 which can house a syringe 2 at its forward end. The syringe is movable axially of the barrel between a position in which its needle 3 is retracted and a position in which that needle projects a set distance.

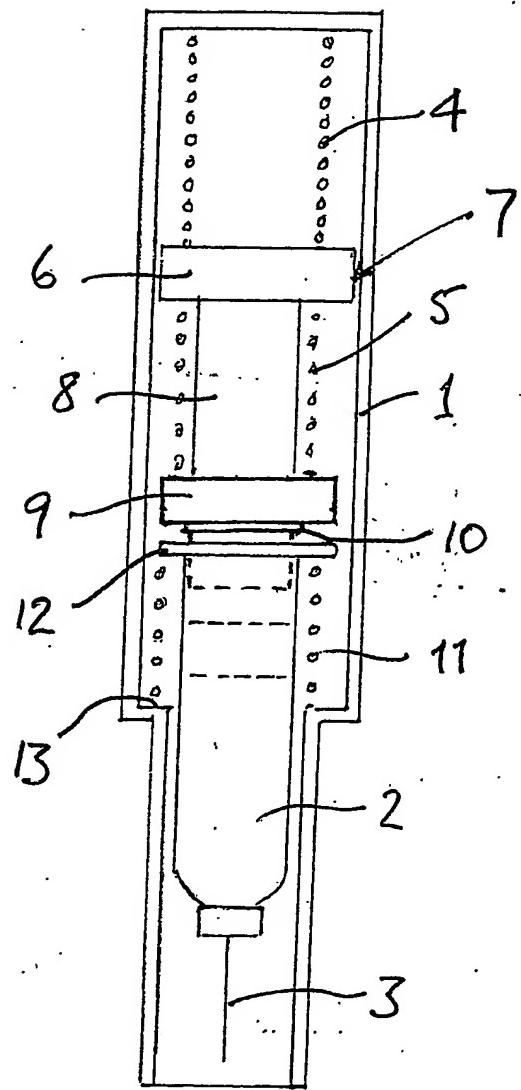
5 The forward drive for the syringe, which first moves the syringe body and then urges its piston forwards to expel the dose, consists of two springs 4 and 5 in tandem. The rear spring 4 is the more powerful and acts between the 10 rear end of the barrel and the head 6 of a mushroom shaped member 7 whose stem 8 extends forwardly and can enter the rear end of the syringe 2. The second spring 5, through which the stem 8 extends, acts between the head 6 and a collar 9 slideable along the stem but limited in the forward direction by a circlip 10. A further light spring 15 11 acts in the rearward direction on the rear flange 12 of the syringe, encircling the syringe body and reacting against an inward shoulder 13 of the barrel 1. The release trigger for the spring drive is not shown for simplicity.

20 Initially, the syringe is retracted, and the main spring 4 is held compressed. Although shown slightly apart, the collar 9 and syringe flange 12 will be closed together, and there is a balance between the springs 5 and 11 that holds the syringe in place.

When the device is fired, the main spring 4 expands, driving the member 7 forwards. The spring 5 is stiff enough and the spring 11 weak enough for the spring 5 to remain expanded, and to thrust the syringe 2 forwards via the collar 9. The spring 4 continues to expand after the syringe has reached its forward position with the spring 11 fully compressed so that the member 7 acts on the piston within the syringe to expel the dose while the spring 5 is compressed. The spring 5 ensures that the syringe is retained in its forward position during this phase.

When the spring 4 is fully expanded, the injection is done and the device is withdrawn with the needle 3 still projecting.

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